



A new species of *Harmonicon* F. O. Pickard-Cambridge, 1896, from central-west Brazil and redescription of *H. rufescens* F. O. Pickard-Cambridge, 1896 (Araneae, Mygalomorphae, Dipluridae)

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Abstract

A new species of *Harmonicon* F. O. Pickard-Cambridge, 1896, is described from the Cerrado biome in Central-West Brazil, representing the first non-Amazonian and the southernmost record for the genus. Furthermore, we present a new diagnosis of the genus, expanding its original diagnosis, and redescribe its type species, *Harmonicon rufescens* F. O. Pickard-Cambridge, 1896, based on an adult female specimen from the same biogeographical area of its type locality.

Key Words

Amazon region, biodiversity, Brasília, Cerrado biome, Diplurinae, Lyra, Pará

Introduction

Dipluridae Simon, 1889 includes eight genera of nocturnal spiders that usually build their burrows on slopes or under logs, using sheet webs (ex. *Linothele* Karsch, 1879) or silk only at the entrance (ex. *Trechona* C. L. Koch, 1850) (Pedroso et al. 2019), and comprises two subfamilies, Diplurinae and Masteriinae Simon, 1889. Diplurinae includes five genera with exclusively Neotropical distribution: *Diplura* C. L. Koch, 1850 (17 species, from Colombia to Argentina); *Harmonicon* F. O. Pickard-Cambridge, 1896 (four species, French Guiana, Brazil); *Harpathele* Wermelinger-Moreira, Pedroso, Castanheira & Baptista, 2024 (three species, Brazil); *Trechona* (eight species, Brazil); and *Linothele* (66 species, from the Bahamas to Brazil) (World Spider Catalog 2024). *Linothele* may be set apart from all other described genera by the absence of the lyra, a stridulatory organ formed by rigid bristles at the inner side of the pedipalp maxilla (Pedroso et al. 2019).

The genus *Harmonicon* was originally described as monotypic, only including *Harmonicon rufescens* F. O. Pickard-Cambridge, 1896. The holotype of this species is an immature male from Pará State, North Brazil, in the Amazonian region (Drolshagen and Bäckstam 2011; World Spider Catalog 2024). The genus was synonymised with *Diplura* by Raven (1985), later rejected by Maréchal and Marty (1998), who added a new species from French Guiana, *H. audeae* Maréchal & Marty, 1998. Currently, all four described species of *Harmonicon* are known from the Amazon region, with records from northern Brazil and French Guiana (World Spider Catalog 2024). *Harmonicon* can be recognised from other genera of the subfamily Diplurinae by the lyra with one series of 5–8 bristles, each with its apex showing an accentuated curvature (Drolshagen and Bäckstam 2011; Pedroso and Baptista 2014); females with two-branched spermathecae (Drolshagen and Bäckstam 2011); and males with the palpal tibia elongated and not inflated (Maréchal and Marty 1998; Pedroso and Baptista 2014).

In this work, we describe a new species of *Harmonicon*, based on both sexes, from Brasília, Distrito Federal, Brazil. This represents the first non-Amazonian and the southernmost record of the genus, with specimens collected in the Cerrado biome in central-west Brazil. We also present a redescription of *H. rufescens*, the type species of the genus, based on a mature specimen for the first time. Our female specimen comes from an area close to its type locality, covered by similar vegetation and in the same biogeographical region.

Methods

Descriptions and terminology follow recent publications on Dipluridae (e.g., Pedroso et al. 2018; Pedroso et al. 2019; Dupérré et al. 2023; Wermelinger-Moreira et al. 2024). Colour patterns were described based on specimens preserved in ca. 75% ethanol and compared to live specimens. All measurements were made directly from the photographs through the Leica Application Suite software: body length was measured from the anterior margin of the chelicerae to the posterior border of the abdomen, not including the spinnerets; carapace length was measured from the anterior margin of the clypeus to the posterior border; and each article of the pedipalp and legs was measured in retrolateral view, from the basal to the distal condyles. Tarsal claw teeth were examined and counted from the left side of the specimen for every leg and are presented in the following order: external-internal. Female genitalia were dissected with fine needles and cleaned with a combination of a borax solution (Álvarez-Padilla and Hormiga 2008) and digestive enzyme tablets of “Orthoplex D.E.F” (Bioconcepts Pty Ltd) for subsequent examination of the spermathecae.

Examination, photographs, and measurements were made with a Leica DFC45P camera mounted on a Leica M205C stereoscope microscope (Leica Camera AG, Wetzlar, Germany) at the Laboratório de Herpetologia, Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ/UFRJ). All photos were edited, and plates mounted in Adobe Photoshop 2020. Maps were compiled in the software package QGIS v. 3.2.6 (<https://qgis.org/en/site/>; accessed 20 August 2024). Geographic coordinates were extracted directly from the original labels. When no detailed geographic information was available, localities were estimated based on Google Earth version 9.1.39.3 (<https://earth.google.com/web/>, accessed 20 August 2024) to the closest minute of latitude and longitude.

Abbreviations

Morphology

ALE anterior lateral eyes;
AME anterior median eyes;
ITC inferior tarsal claw;

PLE posterior lateral eyes;
PLS posterior lateral spinnerets;
PME posterior median eyes;
PMS posterior median spinnerets;
STC superior tarsal claw;
TL total length.

Institutions

MNRJ Laboratório de Aracnologia, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil.
NHMUK Natural History Museum of the United Kingdom, London, United Kingdom.
UFRJ Laboratório de Diversidade de Aracnídeos (LABAR), Universidade Federal do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil.

Taxonomy

Order Araneae Clerck, 1757

Family Dipluridae Simon, 1889

Subfamily Diplurinae Simon, 1889

Harmonicon F. O. Pickard-Cambridge, 1896

Type species. *Harmonicon rufescens* F. O. Pickard-Cambridge, 1896, by monotypy.

Composition. Five species: *Harmonicon audeae* Maréchal & Marty, 1998; *H. candango* sp. nov.; *H. cerberus* Pedroso & Baptista, 2014; *H. rufescens* F. O. Pickard-Cambridge, 1896; and *H. oiapoqueae* Drolshagen & Bäckstam, 2011.

Diagnosis. *Harmonicon* and the other three lyrate genera of Diplurinae (i.e., *Diplura*, *Trechona* and *Harpathele*) can be separated from *Linothele*, by the presence of lyra on the ventral side of each maxilla (Fig. 1C; Pedroso et al. 2018, fig. 9; Pedroso et al. 2019, fig. 3A–H; Wermelinger-Moreira et al. 2024, figs 1C, 3G). *Harmonicon*, *Diplura* and *Harpathele* differ from *Trechona* by having lyra with less than 35 macrosetae in a unique row (Fig. 1C; Pedroso et al. 2018, fig. 9; Wermelinger-Moreira et al. 2024, figs 1C, 3G) (vs. more than 35 setae arranged in a plate with several rows; Pedroso et al. 2019, fig. 3A–H), spinnerets usually longer than abdomen (Fig. 1A; Wermelinger-Moreira et al. 2024, figs 5A) (vs. reaching up to ½ abdomen length on females and ⅔ on males; Pedroso et al. 2019, fig. 4A, B), fovea slightly transverse (Fig. 1A; Wermelinger-Moreira et al. 2024, fig. 1A) (vs. fovea strongly recurved; Pedroso et al. 2019, fig. 4A–C) and medium-sized to large adult body size (females at most 25 mm, males 20 mm) (Figs 1A, 2A; Wermelinger-Moreira et al. 2024, figs 1B, 3B) (vs. large adults, females at least 35 mm, males 23 mm; Pedroso et al. 2019, fig. 4A–C). *Harmonicon* and *Harpathele* differ from *Diplura* by the maxilla of pedipalp with a dorsal transverse suture bearing a strong curve

at its basal third (Fig. 1C; Wermelinger-Moreira et al. 2024, fig. 1C) (vs. straight or slightly curved at its basal third; Pedroso et al. 2018, fig. 9); a field of numerous long and thin setae between the lyra and the transverse suture (Fig. 1C; Wermelinger-Moreira et al. 2024, fig. 1C) (vs. no or just few interspersed short thin setae; Pedroso et al. 2018, fig. 9); and a field of small rigid bristles (spiniform setae) below the same suture (Fig. 1C; Wermelinger-Moreira et al. 2024, fig. 1C) (vs. no rigid bristles; Pedroso et al. 2018, fig. 9). Furthermore, *Harmonicon* and *Harpathele* males do not bear a field of rigid macrosetae on the prolateral face of metatarsus I and have the tibia of pedipalp long and thin (Fig. 2B; Pedroso et al. 2018, fig. 22) (vs. with such field or clasper and tibia of pedipalp clearly inflated and relatively short; Pedroso et al. 2018, figs 14, 21).

Harmonicon can be distinguished from *Harpathele* by carapace brownish red, strongly contrasting with uniform dark grey abdomen in living specimens (Figs 1G, 3G) (vs. carapace brownish not strongly contrasting with abdomen colour; Wermelinger-Moreira et al. 2024, figs 1A, 3A), dorsum of abdomen without transverse stripes (Figs 1A, 2A, 3A) (vs. with transverse light stripes, sometimes difficult to see in males; Wermelinger-Moreira et al. 2024, figs 1B, 3B, 4A, 5A), and lyra formed by 5–8 macrosetae relatively thick and short, each one with basis clearly separated by a gap from the other setae, and apex usually strongly curved (Fig. 1C; Maréchal and Marty 1998, fig. 2A–B; Drolshagen and Bäckstam 2011, fig. 6; Pedroso and Baptista 2014, fig. 6) (except *Harmonicon candango* sp. nov., figs 2H, 3C) (vs. 25–31 macrosetae, usually long, with bases closely placed and apex almost straight or weakly curved, but with some clavate tips in females; Wermelinger-Moreira et al. 2024, figs 1C, 3G, 4B, 5G, 6A–D). Furthermore, *Harmonicon* females have spermathecae formed by two branches rising from one base (Figs 1D–F, 3D–F; Drolshagen and Bäckstam 2011, fig. 5) (vs. one long, curved, and flattened branch, sometimes with a small round lateral vesicle or lobule; Wermelinger-Moreira et al. 2024, figs 2A–D, 4D), and males have embolus reaching between 1.1 and 1.5 as long as the palpal bulb in retrolateral view (Fig. 2B, D; Maréchal and Marty 1998, fig. 4; Drolshagen and Bäckstam 2011, fig. 1; Pedroso and Baptista 2014, fig. 7) (vs. 2 or more times longer than bulb; Wermelinger-Moreira et al. 2024, figs 3C, F, 5E).

Taxonomic notes. A comparative diagnosis of *Harmonicon* and other genera of Dipluridae was published by Pedroso et al. (2018). Since then, *Harpathele* was added to the subfamily, and some updates were made to the diagnosis presented above.

All described *Harmonicon* species have colour pattern and somatic traits generally similar and less variable, with the exception of *H. cerberus*, which exhibits some troglomorphic characters, such as the fused and reduced lateral eyes and the pale yellow carapace (Pedroso and Baptista 2014, fig. 1–3). Most diagnostic characters are related to the genitalia or to sexual dimorphic traits.

An interesting diagnostic somatic character is the shape of the sternal sigilla III. *Harmonicon rufescens*, *H. oiapoqueae*, and *H. candango* sp. nov. share sternal sigilla III with similar longer than wide ellipsoid shape (Figs 1B, 2G, 3B; Drolshagen and Bäckstam 2011, fig. 3). Those sigilla strongly contrast with the rounded (slightly longer than wide) sigilla of *H. audeae* (Maréchal and Marty 1998, fig. 1C). As noted by Pedroso et al. (2018), some species of *Harmonicon* do not bear a lyra with hook-shaped macrosetae. Instead, they are clavate with a long and weaker bent beginning at the median third of the seta, as in *H. candango* sp. nov. (Fig. 2H, 3C). Additional thickened and more sclerotised setae on the maxillae may represent a diagnostic character for at least some species of *Harmonicon*. They are represented by three to five stiff setae placed at the distal half of the maxilla, away from the most basally placed lyra, and at the beginning of the large field of elongated and thin setae that cover its prolateral face, as in *H. cerberus* (Pedroso and Baptista 2014, fig. 6), *H. rufescens* (Fig. 1C), and also in *H. oiapoqueae* (Pedroso et al. 2018). In females, the tarsal claw of the pedipalp has double row of teeth in *H. rufescens*, *H. audeae*, and *H. candango* sp. nov., but only one row of teeth in *H. oiapoqueae* (see Drolshagen and Bäckstam 2011, p. 92).

The most useful sexual characters in males are those from the palpal bulb and modified tibia and metatarsus of leg I. Their tibia I bears one distal prolateral macroseta besides the retrolateral spur. In *H. audeae*, the prolateral macroseta is thin and elongated (Maréchal and Marty 1998, fig. 3C, D). In *H. candango* sp. nov., that macroseta is lost, but the dark insertion plate is clearly visible (Fig. 2J), and in *H. oiapoqueae*, a similar plate seems to be present in an Internet photograph taken by Drolshagen, but it is not mentioned or illustrated in the description (Drolshagen and Bäckstam 2011, fig. 7). The only species apparently without such macroseta is *H. cerberus* (Pedroso and Baptista 2014, fig. 11), but its holotype has been destroyed during the MNRJ's fire. The distal retrolateral spur of tibia I is similar in all described species, projected like a small, weakly curved rod in retrolateral view and slightly projected laterally in ventral view. The distal megaspine over the spur is a little more variable in both thickness and curvature. It is more elongate and curved and has a basis slightly thicker in *H. oiapoqueae* (see Drolshagen and Bäckstam 2011, fig. 7) and *H. audeae* (see Maréchal and Marty 1998, fig. 3C, D) than in *H. cerberus* (see Pedroso and Baptista 2014, fig. 11) and *H. candango* sp. nov. (Fig. 2I, J).

In relation to metatarsus I, most species have a retrolateral tubercle at its basal third, but it is absent in *H. audeae* (see Maréchal and Marty 1998, fig. 3D). The shape and size of the tubercle are similar in the three species where it has been recorded, where it appears as a small mound with a rounded point (Fig. 2J; Drolshagen and Bäckstam 2011, fig. 7; Pedroso and Baptista 2014, fig. 11). In *H. candango* sp. nov. and *H. cerberus*, there is a retrolateral macroseta at the ventral side near the retrolateral tubercle of metatarsus I (Fig. 2J; Pedroso and Baptista 2014, fig. 11), which

is not found in *H. oiapoqueae* (see Drolshagen and Bäckstam 2011, fig. 7). In *H. candango* sp. nov., that macrosetae is placed at the same level of the tubercle (Fig. 2J), but it is placed basally to the tubercle in *H. cerberus* (Pedroso and Baptista 2014, fig. 11).

The palpal bulb differs among the species. In *H. audeae*, it is thin and piriform (Maréchal and Marty 1998, fig. 4A–C), while it is wider and more rounded in *H. cerberus*, *H. oiapoqueae*, and *H. candango* sp. nov. (Fig. 2C–F; Pedroso and Baptista 2014, fig. 7–9; Drolshagen and Bäckstam 2011, fig. 1, 2). In retrolateral view, the embolus may be about as long as (*H. cerberus*, see Pedroso and Baptista 2014, fig. 7) or a little longer (*H. oiapoqueae*, ca. 1.2×, Drolshagen and Bäckstam 2011, fig. 2) than the bulb proper, but may also be elongated (*H. candango* sp. nov., ca. 1.5× longer, Fig. 2B, D).

In females, the spermathecae and its accessory parts are very useful for diagnosis. The median branch of the spermathecae varies from about the same length as the lateral branch and ending in a rounded, blunt tip (*H. oiapoqueae*, Drolshagen and Bäckstam 2011, fig. 5) to a little longer than the lateral branch and ending in a tip with 3–4 lobules (ex. *H. candango* sp. nov., Fig. 3D–F). The lateral branch may have its tip folded over its stem (ex. *H. rufescens*, Fig. 1D–F) or with several lobules. The lobulated tip may have up to 4–5 lobules (*H. oiapoqueae*, Drolshagen and Bäckstam 2011, fig. 5) or be very wide and multilobulate (Fig. 3D–F).

Distribution. The genus can be found in several localities in the Amazon region, in French Guiana and Pará State, North Brazil. Its geographical range is here extended to Brasília, Distrito Federal, Central-West region of Brazil, in the Cerrado biome. There are also records of undescribed species from Amazonian Peru, the Northeast region, and additional states from the Central-West region of Brazil, according to Pedroso et al. (2018).

Harmonicon rufescens F. O. Pickard-Cambridge, 1896

Figs 1A–G, 4

Harmonicon rufescens F. O. Pickard-Cambridge, 1896: 756, pl. 33, fig. 3, 6, pl. 35, fig. 2–3 (juvenile).

Diplura rufescens: Raven, 1985: 153 (synonymy and transfer to *Diplura*).

Harmonicon rufescens: Maréchal & Marty, 1998: 500 (rejected synonym with *Diplura*).

Material examined. Holotype: BRAZIL • ♂ imm., lower Amazon, Santarém, Pará; no date; F. O. Pickard-Cambridge and Austen leg; NHMUK (no registration number). Not examined.

Other material. BRAZIL • ♀; Pará, Altamira [3°12'08.3"S, 52°13'36.4"W]; 14 April 2009; A. P. L. Giupponi and D. R. Pedroso leg.; UFRJ 2575) • 2♀♀, 5j; same data as for previous; MNRJ 4371 • ♀, 4j; same locality as preceding; 2–7 April 2011; D. R. Pedroso leg; MNRJ 4362.

Diagnosis. Females of *H. rufescens* and *H. oiapoqueae* present spermathecae with median branch ending in a blunt rounded tip and without additional lobules (Fig. 1D–F; Drolshagen and Bäckstam 2011, fig. 5). Females of *H. rufescens* can be separated from *H. oiapoqueae* by the tarsal claw of the pedipalp with a double row of teeth (vs. unique row; Drolshagen and Bäckstam 2011, p. 92); and spermathecae lateral branch with its tip folded over the stem and without lobules (vs. tip bearing several lobules) (Fig. 1D–F; Drolshagen and Bäckstam 2011, fig. 5).

Taxonomic notes. *Harmonicon* was established by F. O. Pickard-Cambridge (1896) to accommodate a single species, *H. rufescens*, based on a presumed female specimen from Santarém, Brazil. Drolshagen and Bäckstam (2011, p. 91) were able to examine the holotype and noticed that “Cambridge (1896) was incorrect in stating that the holotype of *Harmonicon rufescens* is a female; it is in fact a juvenile male”. The female described here is from Altamira, also in the Pará state, Brazil, and located ca. 300 km from Santarém. Both localities are placed in the lower Amazons, have similar climate, low altitude, and are covered by dense or open Ombrophile Amazonian Forest and Savannas (Magnusson et al. 2008). Other Dipluridae species collected in Santarém at the same expedition to lower Amazon as *H. rufescens* also have large distribution range. *Diplura sanguinea* (F. O. Pickard-Cambridge, 1896) is widespread through North and Northeast regions of Brazil (Brescovit et al. 2021) and is also found in Colombia (Sherwood et al. 2023). *Diplura nigra* (F. O. Pickard-Cambridge, 1896) has been recorded from several localities around Santarém (Brescovit et al. 2021), and we examined specimens from other localities from Pará, Amazonas, Roraima, Rondônia, and Mato Grosso states in Brazil. The only other species described for the same Brazilian state is *H. cerberus*, from Pequiá cave, near Carajás, in the municipality of Parauapebas, but its male holotype has several troglomorphic characteristics, and its type locality is placed ca. 660 km away from Santarém (Pedroso and Baptista 2014). Besides, the region around the cave where *H. cerberus* was collected is covered by the Amazon “canga” vegetation, which covers areas rich in iron ores and has unique vegetation (Mota et al. 2018).

Description. Female (UFRJ 2575). Carapace oblong, wider at middle portion, light orange-brown, covered with dark setae, caput slightly elevated, darker; cephalic area not shortened, darker furrows, margins of thoracic area with a row of long, thick, rigid, erect, and curved dark setae pointing ectally (Fig. 1A). Clypeus long, with frontal margin carrying 19 median-to-long, thick setae facing forward (Fig. 1A). Eye tubercle with 15 thick setae on its anterior margin; area between eyes with 11 short and thickened setae, and others abundant and dark but not thickened setae (Fig. 1A). Eye formula: ALE>PLE>AME>PME. Ocular area much wider than long. Anterior eye row slightly recurved. Posterior eye row slightly recurved. Median ocular quadrangle wider than long, wider at its posterior margin. AME rounded,

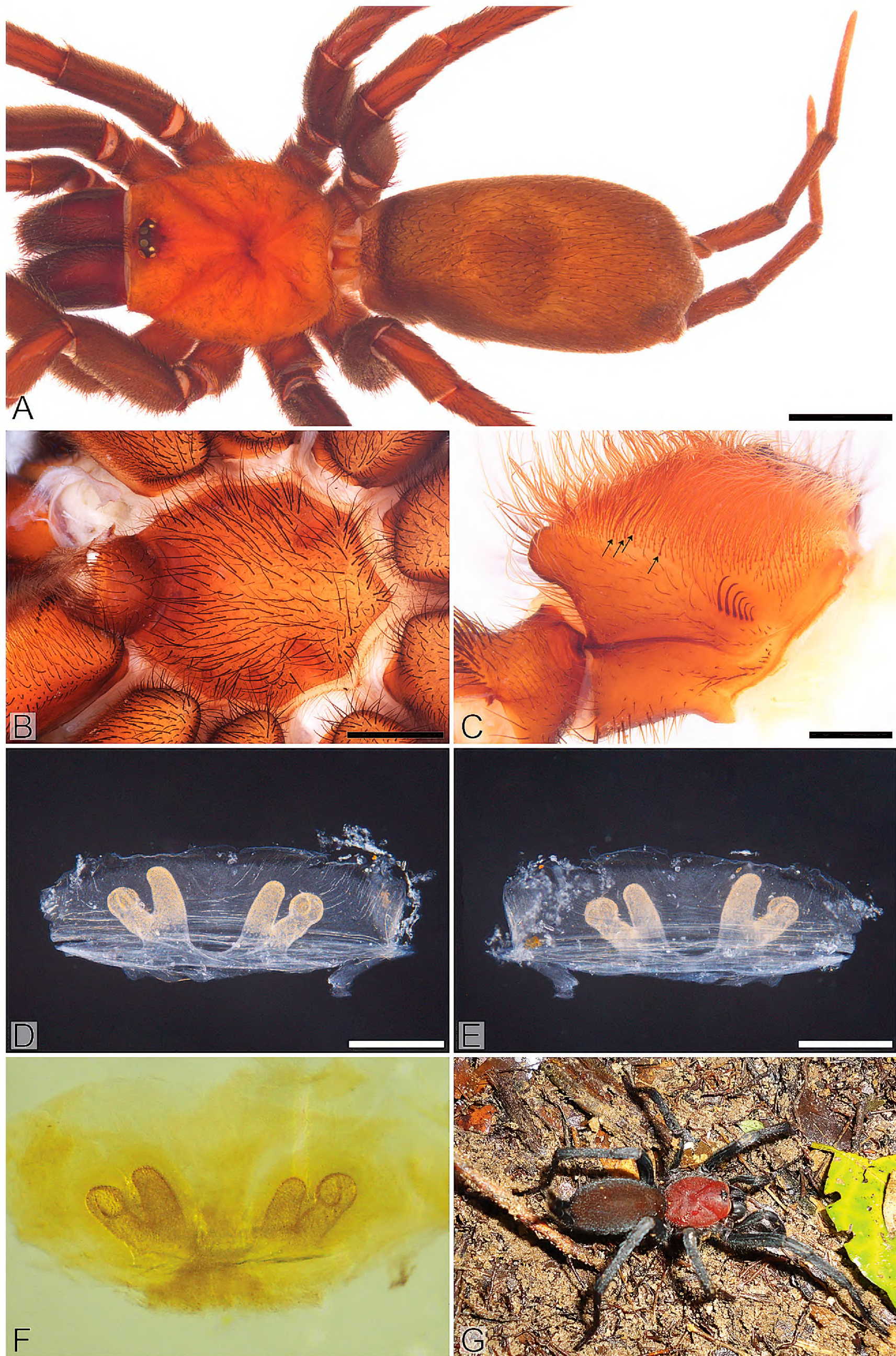


Figure 1. *Harmonicon rufescens*, female (UFRJ 2575). **A.** Dorsal habitus; **B.** Sternum; **C.** Lyra of left maxilla, ventral view (arrow points to thick erect and regularly curved setae); **D–F.** Spermathecae: **D.** Ventral view; **E.** Dorsal view; **F.** Ventral view, partially cleared; **G.** Alive immature female specimen in nature (MNRJ 4362). Scale bars: 5 mm (**A**); 2 mm (**B**); 1 mm (**C**); 0.5 mm (**D–E**). Living specimen photo by Denis Pedroso.

ALE and PLE elliptical, and PME reduced in size, oval. AME-AME separated by less than its diameter. AME contiguous to PME. AME separated from PME by around half of its diameter. ALE and PME contiguous to PLE. Fovea transverse and slightly recurved (Fig. 1A). Labium wider than long with no cuspules (Fig. 1B). Sternum longer than wide, covered by black stiff setae and brownish thin recumbent setae, one pair of labial comma-shaped sigilla clearly separated from each other, three sternal sigilla near margin on each side, increasing in size from first to last, the third one much larger and elliptical (Fig. 1B). Chelicerae dark red with 10 promarginal teeth at left chelicera and 12 promarginal teeth at right chelicera, fangs furrow with denticles. Plectrum with 6–8 separated thick setae on left side and right side, respectively. Maxillae elongated with 25 cuspules at the right side and 31 at the left one (Fig. 1B). Lyra at ventral side of maxilla, asymmetrical, formed by 6–7 modified thick and long setae, increasing in size in a basal to distal direction, with a distinct gap between the base of each seta (Fig. 1C). Left lyra with six setae (Fig. 1C), right lyra with seven (two broken) setae. Left lyra thick, erect, regularly curved setae (Fig. 1C, arrows) placed distally and interspersed among the field of long and thin setae covering the retrolateral face of maxilla, five at the left side and four at the right side. Leg formula $IV > I > II > III$; length of segments (femur + patella + tibia + metatarsus + tarsus = total length): I – $8.4 + 2.8 + 8.3 + 6.9 + 5.1 = 31.5$, II – $7.4 + 2.6 + 7.5 + 6.9 + 4.8 = 29.2$, III – $6.7 + 2.3 + 7.0 + 8.2 + 4.6 = 28.8$, IV – $8.6 + 2.7 + 9.6 + 10.8 + 4.9 = 36.6$. Tarsi with few cracks covering almost all dorsal and lateral faces, except by basis and tip of article; all tarsi and metatarsi with thin scopula, metatarsi with inconspicuous scopula; pedipalp tarsi with middle to apical scopulae; pedipalp claw with seven teeth; ITC without teeth; STC teeth: I: 9–5, II: 9–4, III–IV: 10–4. Macrosetae: Leg I: femur pld0–0–2, d1–1–1, rld0–0–1, patella 0, tibia v1–1–3 right, p0–1–1, v1–1–2 left, metatarsus v2–1–2; Leg II: femur d2–1–0, pld0–0–1 left, pld0–2–1 right, patella pld0–0–1 left, tibia p0–0–1 left, p0–1–1 right, v1–2–2 right, v1–1–2 left, metatarsus v1–2–2, p0–1–0; Leg III: femur pld0–0–2 left, d2–0–0, rld0–2–1 left, rld2–2–1 right, patella 0, tibia p0–1–1, rld1–0–0, r0–2–1 left, r0–1–1 right, v2–0–2 left, v2–2–2 right, metatarsus d0–0–2, r0–2–0 left, rld1–0–0 left, r1–2–2 right, p2–1–0, v2–2–2 right, v3–2–3 left; Leg IV: femur rld2–2–1, d1–1–0 right, d2–1–0 left, patella r0–1–0, tibia rld 1–0–0, p1–0–1, r1–1–1, v2–2–2, metatarsus rld2–1–1 left, rld2–2–1 right, r0–2–0 left, pld 2–1–1, v2–1–3 left, v3–1–3 right. Abdomen light brown with no stripes (Fig. 1A), covered with dark setae, venter uniformly brown. PLS longer than half of abdomen, with articulate fusules on all articles, and last article finger-like and with light patches of ventral cracks (Fig. 1A). Spermathecae separated by ca. $1.5\times$ its length, with two sclerotised thick stems (or branches), originating from a common basis poorly sclerotised and translucent, each branch with almost the same thickness and length; median branch slightly curved laterally and

with large, rounded, and blunt tip without vesicles; lateral branch straight, with a wider rounded head, with its tip rounded and folded upon the stem (Fig. 1D–F).

TL 26.9. Carapace 10.2 long, 9.1 wide, carapace length/width 1.12. AME 0.32 mm, AME-AME 0.24 mm. Abdomen 16.7 long, 8.5 wide. Spinnerets: PMS 2.6 long; PLS 16.2 long, basal article 4.7, middle 4.9, distal 6.6.

Variation. Females ($n = 6$). TL 24.4–32.9. Chelicerae with 10 to 13 promarginal teeth, plectrum with five to eight setae, 25 to 40 maxillary cuspules, and lyra with five to seven bristles.

Distribution. Only known from Altamira and Santarém cities, Pará State, Brazil (Fig. 4).

Harmonicon candango sp. nov.

<https://zoobank.org/8C021216-678A-4C8F-B3EA-B885945C8915>

Figs 2A–J, 3A–G, 4

Material examined. Holotype: BRAZIL • ♂; Brasília, Distrito Federal [$15^{\circ}44'20.1''S$, $47^{\circ}55'36.9''W$]; 18 October 1973; W. R. Lourenço leg.; MNRJ 7625.

Paratypes: BRAZIL • ♀; same data as for preceding; MNRJ 7626; 4♂♂, 19j; same data as for preceding; MNRJ 13709.

Etymology. The specific epithet “candango” is a masculine noun in apposition used to designate the inhabitants of the city of Brasília, especially to the immigrants from Northeast Brazil who built the city.

Diagnosis. *Harmonicon candango* sp. nov. can be separated from all other *Harmonicon* by its lyra composed of setae curved from its base and bearing spatulate tips (Figs 2H, 3C) (vs. setae with strongly curved, thin, and acute tips) (e.g., Fig. 1C; Maréchal and Marty 1998, fig. 2A, B; Drolshagen and Bäckstam 2011, fig. 6). Males of *H. candango* sp. nov. resemble *H. oiapoqueae* by the dark colour and the similar pedipalp bulb profile, with a low hump at the bulb near the basis of embolus, which is not crooked and almost straight (Fig. 2B, D). They may be recognised from those of *H. oiapoqueae* by the presence of the ventral setae near the retrolateral tubercle at metatarsus I (Fig. 2J), tibia I with retrolateral spur bearing thorn thinner and more curved (Fig. 2I, J) (vs. spur thick and almost straight; Drolshagen and Bäckstam 2011, figs 4, 7), and prolateral macroseta opposing the distal spur long and thin (Fig. 2J, just insertion mark) (vs. absent in *H. oiapoqueae*; Drolshagen and Bäckstam 2011, fig. 7). Furthermore, the pedipalp bulb of *H. candango* sp. nov. has a longer embolus (ca. $1.5\times$ longer than the bulb proper, Fig. 2B, D) than *H. oiapoqueae* (ca. $1.2\times$; Drolshagen and Bäckstam 2011, fig. 2) in retrolateral view. Females of *H. candango* sp. nov. are differentiated from *H. oiapoqueae* and *H. rufescens* by the spermathecae with median branch bearing 3–4 apical lobules (Fig. 3D–F) (vs. tip round, blunt, and without lobules) (Fig. 1D–F; Drolshagen and Bäckstam 2011, fig. 5), and lateral branch with a very wide and multilobulate tip (Fig. 3D–F) (vs. tip with few lobules or folded over the stem) (Fig. 1D–F; Drolshagen and Bäckstam 2011, fig. 5).

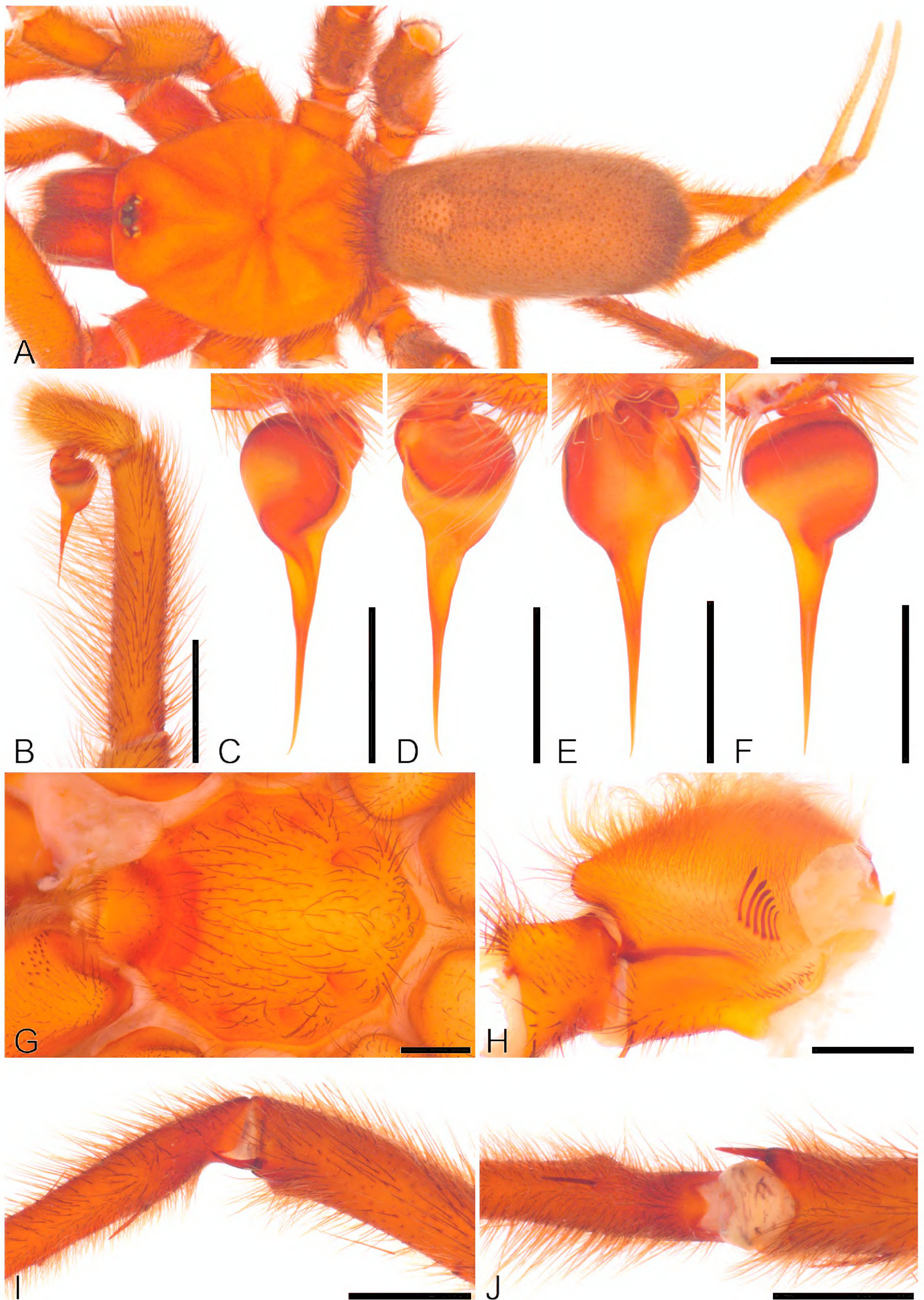


Figure 2. *Harmonicon candango* sp. nov., male holotype (MNRJ 7625). **A.** Dorsal habitus; **B–F.** Male left pedipalp: **B.** Tibia, retrolateral view; **C–F.** Palpal bulb; **C.** Prolateral view; **D.** Retrolateral view; **E.** Dorsal view; **F.** Ventral view; **G.** Sternum; **H.** Lyra of left maxilla, ventral view; **I–J.** Tibia I: **I.** Retrolateral view; **J.** Ventral view. Scale bars: 5 mm (**A**); 2 mm (**B**, **I–J**); 1 mm (**C–H**).

Description. Male (holotype, MNRJ 7625). Carapace oblong, wider at middle portion, light orange-brown, caput slightly elevated and darker; cephalic area with darker furrows, covered with dark setae; and margins of thoracic area with a row of long, thick, rigid, erect, and curved dark setae pointing ectally (Fig. 2A). Clypeus long, with frontal margin carrying 15 median-sized to long, thick setae facing forward (Fig. 2A). Eye tubercle with 10 thick setae on its anterior margin; area between eyes with 10 shorter, thicker setae and others abundant dark but not thicker setae (Fig. 2A). Eye formula: ALE>PLE>AME>PME. Ocular area much wider than long. Anterior eye row slightly recurved. Posterior eye row slightly recurved. Median ocular quadrangle wider than long, wider at its posterior margin. AME rounded, ALE and PLE elliptical, and PME reduced, oval. AME-AME separated by less than its diameter. AME contiguous to PME. AME separated from PME by ca. half its diameter. ALE and PME contiguous to PLE. Fovea transverse and slightly recurved (Fig. 2A). Labium wider than long with no cuspules (Fig. 2G). Sternum longer than wide, covered by black erect setae and brownish thin recumbent setae, one pair of labial sigilla comma-shaped and almost touching each other along the median line of the body, three sigilla on each side near margin, increasing in size from first to last, the third pair larger and elliptical (Fig. 2G). Chelicerae dark red with 11 promarginal teeth at right and 12 promarginal teeth at left, fang furrow with denticles. Plectrum with five separated thick setae on both sides. Maxillae elongated with 22 and 25 cuspules at left and right pedipalps, respectively (Fig. 2G). Lyra asymmetrical at ventral side of maxilla, formed by 6–7 modified thick and long setae, increasing in size basally to distally; apical portion with 1–2 less curved setae and subsequent ones strongly curved. Left lyra with six (Fig. 2H) and right one with seven setae. Leg formula $IV > I > II > III$; length of segments (femur + patella + tibia + metatarsus + tarsus = total length): I – $8.0 + 2.7 + 8.6 + 8.2 + 5.3 = 32.8$, II – $6.4 + 2.0 + 7.2 + 6.7 + 5.1 = 27.4$, III – $6.2 + 1.5 + 6.1 + 7.7 + 4.9 = 26.4$, IV – $7.3 + 2.1 + 8.1 + 10.1 + 6.4 = 34.0$. Leg I with modified tibia and metatarsus, forming a clasping mechanism (Fig. 2I, J). Tibia I with retrolateral spur (or apophysis) relatively long, elevated and pronounced in both lateral and retrolateral view, thicker than its thorn, curved and blunt (Fig. 2I, J); thorn longer than the spur, relatively thin, curved at retrolateral view (Fig. 2I), straight at ventral view (Fig. 2J), pointed at tip, and with prolateral distal spine (fallen off, but indicated by its insertion). Metatarsus I with retrolateral tubercle obtuse, with wide basis, and situated about the same level as the basis of the first ventral macroseta at the retrolateral side, tubercle region slightly thickened in ventral view (Fig. 2I, J). Tarsi with few small cracks covering almost all dorsal and lateral faces, except by basis and tip of article; all tarsi with dense scopulae; metatarsus I–II with scopulae; metatarsus I with more than metatarsus II; metatarsus III–IV with thin scopulae; ITC without teeth; STC teeth: I: 11–5, II: 13–5, III: 12–4, IV: 10–4. Macrosetae: Leg I: femur pld0–0–2, d3–2–0 right, d1–

2–0 left, rld1–1–1, patella 0, tibia r1–1–0, p1–1–1 right, p0–1–1 left, v1–1–1ap (apophysis), metatarsus v1–1–1; Leg II: femur d1–2–0 right, d2–2–0 left, pld0–2–1 right, rld0–1–2 left, patella 0, tibia p0–1–1, v1–1–2, metatarsus v1–2–1 right, v1–1–2 left, p0–1–0; Leg III: femur d2–1–0, rld1–1–1, pld1–2–1, patella 0, tibia d0–1–1 right, d0–1–0 left, p0–1–1, v1–0–2 right, v1–1–2 left, metatarsus d1–1–1, rld1–1–0, pld0–2–1 left, p1–1–1 right, v2–2–3; Leg IV: femur rld2–2–1, d4–2–0, pld1–1–0 right, pld1–1–1 left, patella 0, tibia d0–1–0, p1–1–0, r0–1–1, rld1–0–0, v1–2–2 left, v2–2–2 right, metatarsus d2–2–2, rld1–2–0 right, p0–1–1 right, v2–1–4, p1–1–1 left, plv0–0–1 left, r1–1–1 left. Abdomen covered with dark setae, dorsum brown without stripes, with a slightly paler area before the cardiac mark, which is outlined by a somewhat darker brown line (Fig. 2A), and venter uniform brown. PLS longer than half of abdomen, with articulate fusules in all articles, and last article finger-like and with light patches of ventral cracks (Fig. 2A). Pedipalp elongated, bearing three macrosetae, one retrolateral placed near the end of its median third (Fig. 2B, fallen off, just the insertion), one prolateral at its distal third, and one prolatero-ventral at its median third. Pedipalp bulb $0.25\times$ longer than wide, oblong in prolateral (Fig. 2D) and retrolateral views (Fig. 2C), but more globose in dorsal (Fig. 2E) and ventral views (Fig. 2F), tapering to merge with embolus basis well demarcated (Fig. 2C–F). Embolus around $1.5\times$ longer than bulb itself, almost straight, tapering towards its acute, slightly curved tip (Fig. 2C–F).

TL 20.1. Carapace 9.0 long, 7.8 wide, carapace length/width 1.15. AME 0.27 mm, AME-AME 0.23 mm. Abdomen 11.1 long, 5.4 wide. Spinnerets: PMS 1.8 long; PLS 13.4 long, basal article 3.5, middle 4.1, distal 5.8.

Female (paratype, MNRJ 7626). Carapace and clypeus as in male (Fig. 3A). Eye tubercle with 13 thick setae on its anterior margin; area between eyes with 13 shorter, thicker setae and others abundant grey and thinner setae (Fig. 3A). Eyes as in male (Fig. 3A). Labium and sternum as in male (Fig. 3B). Chelicerae, as in male with 11 promarginal teeth at both sides. Plectrum as in male but with 8–9 separated thick setae on left side and right side, respectively. Maxillae with shape as in male but bearing 29 and 27 cuspules at the left and right pedipalp, respectively (Fig. 3B). Lyra at ventral side of maxilla similar to male. Left lyra with seven regular setae and an additional distal one much thinner than the others (Fig. 3C), right lyra with seven setae. Leg formula $IV > I > II > III$; length of segments (femur + patella + tibia + metatarsus + tarsus = total length): I – $6.1 + 2.4 + 6.5 + 5.2 + 3.6 = 23.8$, II – $5.0 + 2.2 + 5.7 + 4.8 + 3.4 = 21.1$, III – $5.1 + 1.2 + 5.0 + 5.7 + 3.3 = 20.3$, IV – $5.8 + 1.6 + 6.7 + 7.9 + 4.3 = 26.3$. Tarsi and metatarsi as in male, palpal tarsi with middle to apical scopulae; pedipalp claw with eight teeth; ITC without teeth; STC teeth: I: 12–3, II: 8–4, III: 12–3, IV: 8–3. Macrosetae: Leg I (right absent): femur pld0–0–1 left, d1–1–0 left, rld0–0–1 left, patella 0 left, tibia p0–1–1 left, v1–1–2 left, metatarsus v1–2–1 left; Leg II: femur d1–1–0, pld0–1–1, patella 0, tibia p0–1–1, v0–1–1 right,

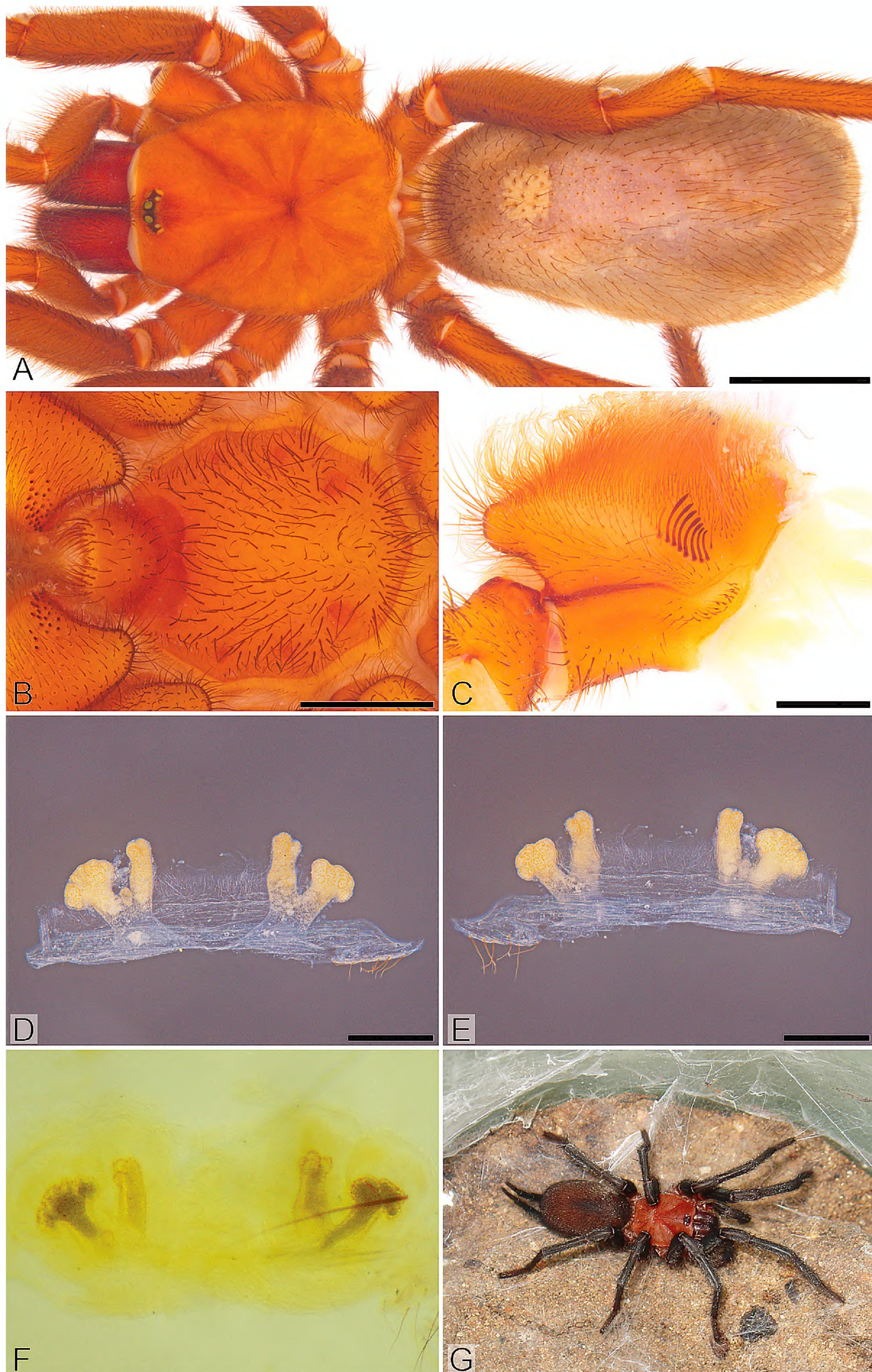


Figure 3. *Harmonicon candango* sp. nov., female paratype (MNRJ 7626). **A.** Dorsal habitus; **B.** Sternum; **C.** Lyra of left maxilla, ventral view; **D–F.** Spermathecae: **D.** Ventral view; **E.** Dorsal view; **F.** Ventral view, partially cleared; **G.** Alive female specimen in captivity. Scale bars: 5 mm (**A**); 2 mm (**B**); 1 mm (**C**); 0.5 mm (**D–E**). Living specimen photo by Denis Pedroso.

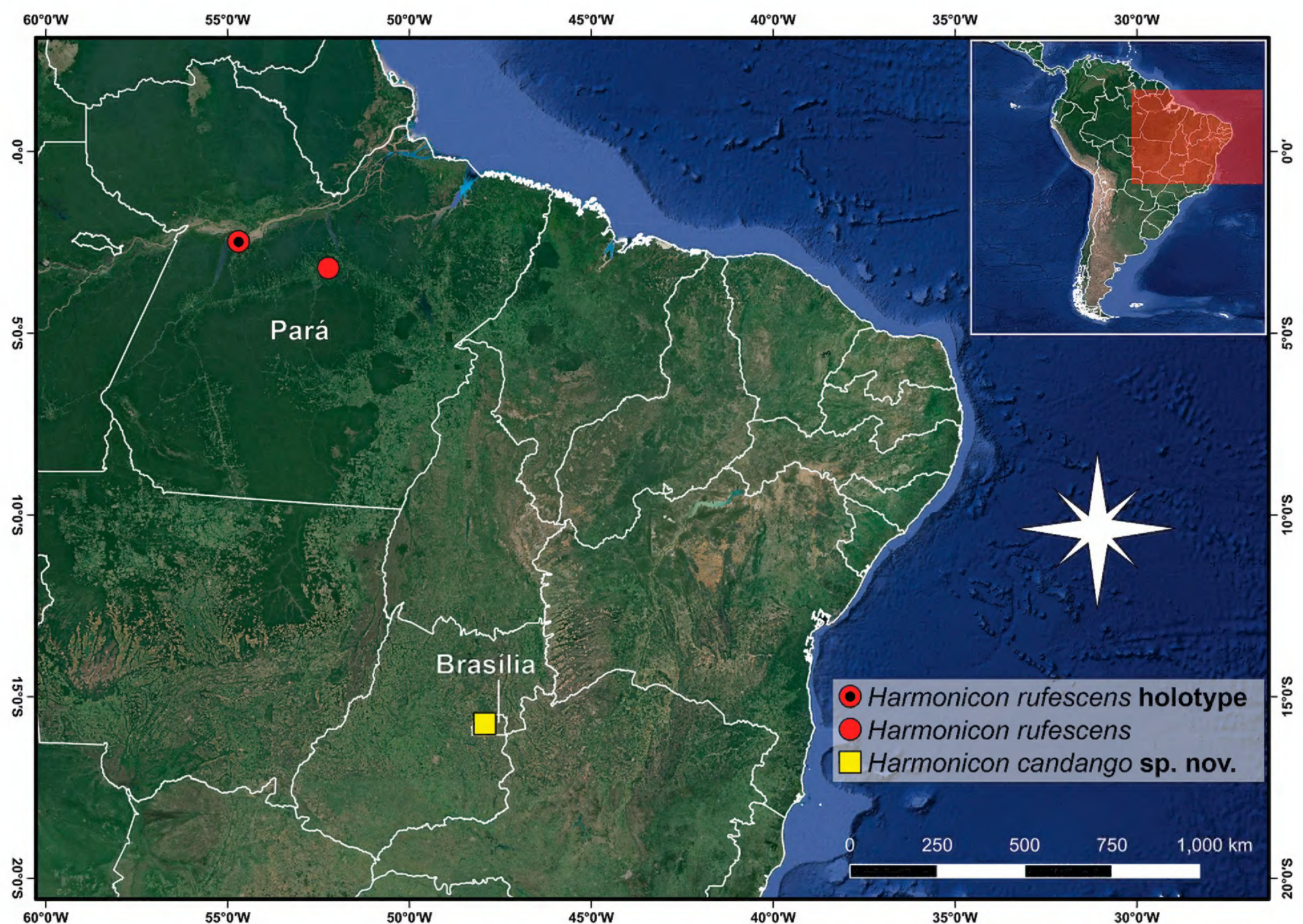


Figure 4. Distribution records of *H. rufescens* (holotype = red and black circle, specimen here described = red circle) and *H. candango* sp. nov. (yellow square).

v0–1–2 left, metatarsus p0–1–0 left, v1–2–3 left, v1–2–2 right; Leg III: femur d3–0–0 right, d2–0–0 left, rld1–1–1, pld0–1–1 right, pld0–1–0 left, patella 0, tibia rld1–0–0, r1–1–0 right, r0–1–0 left, p1–1–0, v1–1–2, metatarsus d0–0–2, p1–1–1, pld0–1–1 left, r1–1–0, v2–2–1 left, v2–2–3 right; Leg IV: femur d2–1–0 right, d4–1–0 left, rld1–3–1 left, rld1–2–1 right, patella 0, tibia rld1–0–0, r1–1–0, p1–1–0, v1–0–2, v1–1–2 right, metatarsus p1–1–1 left, p1–1–0 right pld0–1–1, rld1–2–1, v1–4–3 left, v2–3–3 right. Abdomen similar to male, slightly damaged, dorsally with a paler anterior area near the cardiac mark (Fig. 3A). Spermathecae separated by ca. $1.2\times$ its length, with two thick stems (or branches) at each side, basal part not sclerotised, translucent, remaining portions sclerotised, opaque, and yellowish brown, each branch with almost same thickness; median branch basally straight with a curvature at the middle portion outwards and then straight up to its tip with 3–4 lobules; lateral branch straight with tip much larger than its stem; and tip of the median branch multilobulated (Fig. 3D–F).

TL 24.9. Carapace 9.4 long, 7.6 wide, carapace length/width 1.24. AME 0.29 mm, AME–AME 0.26 mm. Abdomen 15.5 long, 8.8 wide. Spinnerets: absent.

Taxonomic notes. Our interpretation of the published drawings and photos of some *Harmonicon* species differs from those stated in their respective original publications.

For example, the *H. cerberus* holotype seems to have suffered a torsion during its collecting and conservation process. Pedroso and Baptista (2014) stated that the figures 7, 8, and 9 of the palpal bulb of *H. cerberus* were retrolateral, prolateral, and dorsal views, respectively. However, we now consider their fig. 9 as better interpreted as retrolateral, matching the profile of the palpal bulbs of other *Harmonicon* species (i.e., Fig. 2D, F). Furthermore, Pedroso and Baptista (2014, fig. 8) seems to be a dorsal view, while Pedroso and Baptista (2014, fig. 7) is then a ventral view (vs. Fig. 2E, F). A similar torsion has probably happened in the male holotype of *H. oiapoqueae*. Drolshagen and Bäckstam (2011) stated that they included drawings of the retrolateral and prolateral views (Drolshagen and Bäckstam 2011, figs 1, 2) of the right pedipalp, but careful comparison indicates that they are respectively dorsal and ventral views, both slightly inclined sideways.

Variation. Males ($n = 5$). TL 14.4–20.1. Chelicerae with 10–12 promarginal teeth, plectrum with 5–8 setae, maxillary cuspules from 22–38. Tibia I with prolateral distal macrosetae thinner and longer than the retrolateral thorn (whenever present). Pedipalp tibia with a variable set of macrosetae, sometimes with the prolateral or retrolateral lacking, often with the prolateroventral lacking.

Distribution. Only known from Brasília, Distrito Federal, Brazil, a locality in the Cerrado biome (Fig. 4).

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